ATP SYNTHESIS ACTIVATOR

FIELD OF THE INVENTION

The present invention relates to an ATP synthesis activator for promoting the synthesis of ATP (adenosine triphosphate) used as an energy source for living cells.

BACKGROUND OF THE INVENTION

ATP is a nucleotide molecule having three phosphate molecules attached to a 5-hydroxyl group on a ribose of adenosine, which has a formal name of adenosine 5'-triphosphate. ATP, which was found by Fiske et al. in 1929, is a compound widely present in any living tissue or organism including animal's muscles or yeast cells.

ATP has two high-energy phosphate bonds per molecule, thereby yielding a free energy of about 7.3 kcal/mol when hydrolyzed around a neutral pH and itself being converted into adenosine diphosphate. Thus, the energy yielded from ATP hydrolysis allows nucleic acid synthesis as well as various metabolisms including protein metabolism, carbohydrate metabolism and/or lipid metabolism. A compound having a phosphate ester bond provided from ATP will enter an "activated state" to contribute to various synthesis reactions.

ATP production techniques utilizing chemical reactions are broadly divided into two groups: an enzyme-catalyzed technique using a phosphoenzyme and a fermentation-based technique using glycolysis in yeast cells.

An enzyme used in such an enzyme-catalyzed technique includes acetate kinase, carbamate kinase and creatine kinase, and in these cases, acetyl phosphate, carbamyl phosphate and creatine phosphate are used as a phosphate donor, respectively. In an embodiment of this technique in a bioreactor, there has been developed a procedure using acetate kinase and adenylate kinase isolated in a pure form from a

thermophilic bacterial strain, *Bacillus stearothermophilus*. On the other hand, a fermentation-based technique using glycolysis in yeast cells involves ATP production through phosphorylation at a substrate level. This technique is based on the fact that two ATP molecules can be generated when one molecule of glucose is metabolized into two molecules of ethanol and two molecules of CO_2.

In the pharmaceutical and food fields, however, there has been no activator known to be particularly effective in promoting ATP synthesis in the body. The promotion of ATP synthesis in the body can eliminate the need for oral ATP administration to increase ATP level in the body. Further, prolonged promotion of ATP synthesis may contribute to health maintenance and the like.

SUMMARY OF THE INVENTION

In view of the prior circumstances mentioned above, the object of the present invention is to provide an ATP synthesis activator which allows the promotion of ATP synthesis in the body and results in an increased ATP level in the body for a long period of time.

Our research efforts were directed to achieving the above object, and we have found that when electron generation in the body can be stimulated, ATP synthesis can be effectively promoted by the generated electrons, thereby finally completing the invention.

More specifically, the ATP synthesis activator of the present invention comprises, as an active ingredient, a mixture of a plurality of herbs having an ion-exchange capacity.

The ATP synthesis activator of the present invention can stimulate electron generation in the body and hence results in an improved ATP synthesis activity due to

the generated electrons, because dietary fiber contained in the herbs has an ion-exchange capacity.

The ATP synthesis activator of the present invention preferably generates electrons in the body to give a potential of -300 mV or less.

Further, the ATP synthesis activator of the present invention preferably comprises at least one or more herbs selected from thyme, rosemary, turmeric, fennel, grape seeds, dandelion, and *Acanthopanax senticosus*.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows ATP levels measured before and 3 days after the administration of an ATP synthesis activator.

Fig. 2 shows a comparison of tumor volumes between an ATP synthesis activator-administered group (test group) and a control group.

Fig. 3 shows a comparison of IL-12 and TNF-α levels between an ATP synthesis activator-administered group (test group) and a control group.

DETAILED DESCRIPTION OF THE INVENTION

The ATP synthesis activator of the present invention will be described below in more detail.

The ATP synthesis activator comprises a mixture of a plurality of herbs. Any type of herb may be used in combination so long as it contains dietary fiber having an ion-exchange capacity. Examples of herbs able to be used include thyme, rosemary, turmeric, fennel, grape seeds, dandelion, and *Acanthopanax senticosus*. In particular, among these herbs, at least one or more herbs may be selected and combined for use in

the present invention.

More specifically, in a case where all of thyme, rosemary, turmeric, fennel, grape seeds, dandelion, and *Acanthopanax senticosus* are used, they are preferably combined to give a mixture containing 8-12% by weight of thyme, 8-12% by weight of rosemary, 8-12% by weight of turmeric, 13-17% by weight of fennel, 13-17% by weight of grape seeds, 8-12% by weight of dandelion, and 25-35% by weight of *Acanthopanax senticosus*, based on the total weight of the mixture which is set to 100% by weight.

When administered into the body, this ATP synthesis activator exhibits an ion-exchange capacity attributed to dietary fiber contained in the herbs, thereby generating electrons in the body. More specifically, the ATP synthesis activator preferably generates electrons in the body to give a potential of -300 mV or less, thereby enabling the activation of ATP synthesis in the body. As used herein, the activation of ATP synthesis means that a group administered with the ATP synthesis activator shows a significantly increased ATP level in the body when compared with a non-administered group. ATP levels in the body may be quantitatively assayed using an ATP detector (commercially available from Microtec Co., Ltd. under the trade name of HACCP-LIGHT38).

The ATP synthesis activator can be prepared, for example, by subjecting these herbs to dry sterilization at 160°C, followed by mixing, and thereafter processing the sterilized herbs into powder in a mill and then shaping the resulting powdered herb mixture into any given form.

The ATP synthesis activator of the present invention can improve ATP synthesis activity in mitochondria present in cells forming living organisms. This ATP synthesis activator can promote ATP synthesis in mitochondria to prevent metabolic waste products and toxins to be accumulated in the body. The ATP synthesis activator

can therefore prevent cell aging and necrosis.

The ATP synthesis activator of the present invention can also help maintain blood hydrogen ion concentration at a given level, thereby keeping a blood pH of 7.4 ± 0.2. The ATP synthesis activator can therefore improve ATP synthesis activity in the body because it can keep blood pH at 7.4 ± 0.2.

The ATP synthesis activator of the present invention may be used, for example, in order to ameliorate a symptom caused by a decreased ATP synthesis activity in the body. Examples of a symptom caused by a decreased ATP synthesis activity in the body include immune deficiency diseases, e.g., cancer, rheumatism, atopic dermatitis, collagen disease, asthma and pollinosis; adult diseases, e.g., diabetes, myocardial infarction and brain infarction; dementia, Alzheimer's disease and Parkinson's disease. The ATP synthesis activator may be used for the amelioration of any symptom caused by a decreased ATP synthesis activity, not limited to the symptoms listed above. The ATP synthesis activator may also be used to ameliorate any one of the above symptoms or combinations thereof.

The ATP synthesis activator of the present invention may be administered orally or parenterally, preferably parenterally. The ATP synthesis activator may take any dosage form, such as tablets, granules, capsules and powders. The ATP synthesis activator may be administered at an appropriate dose selected depending on the age of a patient and the condition of disease. An effective daily dose may be selected within the range from 5.5 mg to 17.5 mg per kg of the body weight. Alternatively, the dose may be selected per patient within the range from 400 to 600 mg/body, preferably 600 to 800 mg/body, and more preferably 800 to 1200 mg/body. However, the dose of the ATP synthesis activator of the present invention is not particularly limited to these ranges.

The ATP synthesis activator may be administered to a patient at any stage, including before or after the development of a decrease in ATP synthesis activity. It may also be administered at a stage where the development of the above-mentioned symptom(s) is observed or predicted in the patient.

The ATP synthesis activator of the present invention may be formulated in a general manner (Remington's Pharmaceutical Science, latest edition, Mark Publishing Company, Easton, USA). The formulation may further comprise pharmaceutically acceptable carriers and/or additives.

EXAMPLES

The ATP synthesis activator according to the present invention will be further described in the following examples. The examples are provided for illustrative purposes only, and are not intended to limit the scope of the invention.

Example 1:

Preparation of ATP synthesis activator

In this example, an ATP synthesis activator was prepared by mixing herbs in accordance with the following composition:

Thyme	10% by weight,
Rosemary	10% by weight,
Turmeric	10% by weight,
Fennel	15% by weight,
Grape seeds	15% by weight,
Dandelion	10% by weight, and
Acanthopanax senticosus	30% by weight.

To prepare an ATP synthesis activator, first, these herbs were washed with tap water and dried using a spray dryer at 160°C for dry sterilization. Next, the herbs were